DEPARTMENT OF COMMERCE
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GENERAL NOTE.

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

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1 Gas Service Investigations in Georgia and Alabama

Recently the State Commissions of Georgia and Alabama requested the cooperation of the Bureau of Standards in investigating the gas service conditions in a number of cities in these States. Accordingly, one of the Bureau's engineers visited six of these cities to determine the actual state of affairs. The conditions observed were decidedly varied. In one case poor quality of gas-making materials had so decreased the manufacturing capacity of the plant that the gas supply on several occasions had failed. In another case faulty appliance installations had caused a number of cases of asphyxiation, one of which ended fatally; and the report which the Bureau will make will point out the way for remedying this situation. Two places were visited where the gas service seemed to be good, but in one of these previous difficulties, newspaper agitation, and lack of diplomacy on the part of the officials of the company in handling the public had aroused dissatisfaction. In two other places the service was poor and should be improved, though there seemed to be no general complaint.

As a result of these visits and also a visit to the Railroad Commission of North Carolina, it seems likely that one or more of these States will adopt State-wide rules for gas service. In such case, the Bureau's advice and cooperation will be further required.

2 Specifications for Starting and Lighting Batteries for Military Truck Service

Special importance attaches to the formulation of satisfactory specifications for batteries intended for starting and lighting service, because of the magnitude of the industry at the present time and the fact that many new manufacturers are entering the field. The government desires adequate specifications to insure getting good batteries and it is believed that the government specifications, carefully drawn, will react to benefit the public who purchase these batteries in enormous quantities every year.

A conference was held at the Bureau of Standards on February 25th to consider a draft of specifications which has been prepared by this Bureau at the request of the Motor Transport Corps. These specifications, while intended for the Motor Transport Corps particularly, will probably receive wider acceptance in view of the fact that there appear to be no adequate specifications for starting and lighting batteries at the present time.

The conference was called, at the request of the Motor Transport Corps, by the Society of Automotive Engineers who invited members of the Electrical Equipment Committee of that society, representatives of the manufacturers, members of the American Institute of Electrical Engineers' Committee on Storage Batteries, representatives of the Navy Department, the Bureau of Standards, and the Motor Transport Corps.

The matters discussed included the capacity and arrangement of the batteries; the method of rating them; specification for the construction, quality of materials, and the electrolyte. Tests of the battery were outlined to include measurements of the capacity, the retention of charge, the purity of the electrolyte, life tests and vibration tests. While the general form of the specifications was agreed upon, together with a satisfactory system of ratings, some details as to dimensions and performance were left for further consideration of sub-committees, and, consequently, it will be some time before the specifications will be ready for publication.

3 New Instrument for Determining Coefficients of Reflection

In the design of lighting installations and in the case of many other applications of illuminating devices, a knowledge of the value of the coefficients of reflection of walls, ceilings, or other objects

may be of material assistance. The illuminating engineer, with the aid of tables and instructions issued by one of the lamp manufacturers in this country, can predict with a fair degree of certainty the illumination which will be produced by any given type of lighting installation if he knows the shape of the room and the light reflecting characteristics of the walls and ceilings.

At the present time, there is no instrument available outside the laboratory which will enable the engineer to measure the coefficient of reflection of surfaces. Even when the measurements are made in the laboratory, the process is very difficult and tedious, and subject to rather large uncertainties. Several methods have been used, but most of them have given incorrect results because of an error in the value assigned to the standard surface used.

In order to remove the uncertainty in the value assigned to the standard surface, and to develop an instrument which could be applied to the measurement of surfaces in place, a new instrument has been developed after extensive experiments, and a much better standardization of a reproducible surface has been made. This instrument is light and portable, and can be used with any one of a number of types of portable photometers, giving results which are reliable.

The instrument which has been developed is called a reflectometer. Aside from the photometer, which measures the light intensities, it consists of a small metal sphere from which a segment has been removed, leaving about nine-tenths of its original surface. It is painted inside with a diffusing white paint, and a beam of light is projected through a small hole in the wall onto the surface which is to be tested. The test surfaces may be compared with a standard surface or with a flat surface painted with the same paint as the sphere. It is believed that this reflectometer will fill a very real need.

4 Generating Sets for Radio Laboratory Use

The researches and tests in progress in the radio laboratory require the use of steady sources of alternating current of frequencies from 200 to 10,000,000 cycles per second. Several generating sets have been designed and constructed in which electron tubes and associated circuits are used to produce alternating current of the required frequency from a direct current power supply.

One of these generating sets, having a wave

length range of 30 to 50,000 meters (frequency range of 10,000,000 to 6,000 cycles) has been built up with a convenient control panel for use in standardizing wavemeters and other radio apparatus.

Another generating circuit, for use in the study of insulating materials, is designed with special inductance coils and a special condenser with a scale which gives the power loss in the sample of insulating material directly, without any calculation. This generating set is supplied with power from a 600-volt storage battery of small capacity which is arranged in especially convenient form for charging, refilling, and the special care which small storage cells require.

Two low-power generating sets have been designed for portable use and are especially compact. One of these generates current at a wave length of 30 to 2,000 meters. It has six sets of inductance coils, and a variable air condenser in parallel with which a fixed mica condenser can be connected. The other set generates current of 2,000 to 8,000 meters, using three sets of inductance coils and a single variable air condenser.

An electron tube is also employed in a set for generating audio-frequency currents from 200 to 6,000 cycles which is used for alternating-current measurements, studies of telephone receivers, and other work at telephonic frequencies.

A special generating set for producing small measured voltages at radio frequencies of 200 to 4,000 meters wave length is used for measuring amplifiers and detectors. It is so arranged that the instruments which are being measured are completely shielded from both electrostatic and magnetic fields from the generating circuit, the coils of which are wound in a special way, the entire circuit being enclosed within a copper shield.

5 Fish Scaling in Enamels for Sheet Steel

The jumping off of small particles of enamel which results in the defect known in shop practice as "fish scaling" is probably the most serious defect to which enamels for sheet steel are subjected. It occurs intermittently in practically all the plants manufacturing this class of material in this country and entails losses running into millions of dollars to the manufacturers. At the request of the Metalware Manufacturers Association of America, the Enameled Metal Division of the American Ceramic

Society, and of a large number of individual manufacturers, the Bureau is carrying on a comprehensive research in an endeavor to discover the cause or causes of this defect and the methods of controlling and eliminating it. This investigation was begun in July, 1919, and has been conducted energetically ever since.

Up to the present time, the Bureau has made ninety melts of enamel comprised of 21 different compositions. These have been subjected to various treatments in firing and melting and have been applied in various ways to several kinds of steel. In all, over 4,000 sample enameled plates have been made up to date. This work has demonstrated that one of the most important factors in the production of fish scaling is too severe heat treatment in the firing of the enamel. Excess heat treatment may consist of firing the enamel at too high a temperature or of holding the enamel in the furnace for too long a time at a given temperature. Other important factors are the composition of the enamel, the physical and chemical characteristics of the underlying metal, the method of melting the chemical mixtures used in making the enamels and the shape and weight of the metal pieces that are enameled. These various factors have been investigated to a certain extent in this work and will be studied more thoroughly as the investigation progresses.

The data obtained in this investigation up to the present time have enabled the Bureau to be of very material assistance to several manufacturers in eliminating this trouble. It seems very probable that the completion of the investigation as now planned will definitely eliminate fish scaling, and likewise settle the interesting question of what is the physical basis of the phenomenon.

6 The Relation of Composition of Enamel to Solubility in Acids

For several months, the Bureau has had in progress an investigation of the relation of composition of enamel to solubility in strong mineral acids. The need for this investigation was clearly demonstrated during the war by the difficulty manufacturers of acid-resisting enameled wares experienced in meeting the requirements of chemical manufacturing plants. The manufacturers of enameled kitchen wares are also interested in this problem.

Up to the present time, 33 enamel compositions have been melted and tested. While the problem is a large one and the investigational work will necessarily be continued for some time, results so far obtained indicate that some of the commonly accepted

conceptions of the relation between composition and acid resistance of enamels are erroneous. The chief of these misconceptions seems to be that oxides which are similar in nature chemically will have similar effects when incorporated in enamel compositions. That this is not always true is shown by the fact that calcium oxide tends to produce enamels with very low resistance to attack of acids while barium oxide produces quite resistant enamels. In connection with the gathering of data on the chief object of this investigation, information is being secured in regard to relations of composition to their fusibility and to the tendency to chip or to craze, or crack. It is expected that as a result of this investigation the Bureau will be able to advise manufacturers of acid-resisting wares as to the methods of compositions to be used in producing wares of this class superior to any now being made, and also that it will enable the Bureau to be of material assistance to manufacturers of enameled ware for culinary purposes. As a matter of interest, it may be stated that as a part of this investigation an enamel has been produced which appears to duplicate in composition and working properties the best grade of French acid-resisting enamel.

7 Properties of Boiler Plate at Elevated Temperatures

A series of tests on cold rolled boiler plate has been completed. The curves for the various factors obtained in tensile tests show similar variations to those obtained with temperature increase in testing the hot rolled plates, with the exception of a range of about 475 to 675°F. where the proportional limit suddenly increases and the reduction of area shows a distinct increase. In this approximate range, the tensile strength also registers a rather sharp change. It is interesting to note that Bregowsky and Spring, about 10 years ago, found similar abrupt changes in tensile properties of cold rolled Bessemer shafting in about the same temperature range.

8 Recent Chemical Publications

The following publications have recently appeared and may be obtained from the Superintendent of Documents, Government Printing Office:

Bureau of Standards Circular No. 85 - "Recommended Specification for Basic Sulphate White Lead, Dry and Paste";

Bureau of Standards Circular No. 86 - "Recommended Specification for Turpentine";

Bureau of Standards Circular No. 87 - "Recommended Specification for Zinc Oxide, Dry and Paste", and
Bureau of Standards Circular No. 88 - "Recommended Specification for Leaded Zinc Oxide, Dry and Paste".

9 Investigations of Granite and Indiana Limestone

An investigation of the properties of the commercial granites of the United States has been commenced. Certain tests have been made on 12 varieties that are in extensive use in the eastern portion of the country. A summary of the tests on 72 samples of Indiana limestone has been completed and is available for all those interested in the subject. This summary gives the compressive strength, transverse strength, absorption value, porosity, and weight per cubic foot for each of the samples tested. This summary should be of special interest to architects and engineers whose work includes the use of Indiana limestone.

10 Oil Storage in Concrete Tanks

During the past month, 9 additional tanks have been put under test in which are stored oils ranging in specific gravity from .948 to .809. These tanks are made of 1:1½:3 mixture of concrete. Tanks Nos. 1 and 3, in which are stored a fuel oil with a specific gravity of .854, show that some oil has penetrated the concrete and there are two or three large oil stains on the outer surface of the tanks. On the other hand, tanks Nos. 2 and 4 show no sign of the penetration of oil to the outside surface. These tanks have been under test approximately 75 days. Tanks Nos. 5 and 6 are filled with water-white kerosene and have been under test 17 days. As yet no signs are shown of the oil penetrating the 4-inch concrete wall. Tanks Nos. 14 and 15, filled with an oil having a specific gravity of .868, have developed two spots due to oil penetration.

Preparations have been made for the conducting of a field survey of concrete tanks used for storing mineral oils and other commercial fluids. This survey was started February 15 and will be completed early this summer.

11 Concrete Tanks Used for Water Storage

The test of concrete tanks made of 1:2:4 mixture and used for water storage has been discontinued after 150 days because the day-loss curves have taken the form of a straight line showing that the daily loss has become constant. It may be of interest to note that these tanks, although showing some actual loss due to water penetrating the concrete, remained dust dry on the exterior. It would seem from this that although the

head of water amounted to 35 ft. the 1:2:4 concrete is sufficiently waterproof for this purpose.

12 Further Progress of Test on Two-way Reinforced Hollow Tile Floor System

"This test, which has been mentioned in previous bulletins, has made considerable progress during the past month. A live load of about 400 lb. per sq. ft. has been applied to the panels 16 ft. square; a live load of about 250 lb. per sq. ft. has been applied to the 16 ft. x 19 ft. 3 in. panels, and a live load of about 200 lb. per sq. ft. has been applied to the 16 ft. x 22½ ft. panels. This form of loading has equalized the stresses in steel reinforcement in all panels as nearly as it seems practicable to do so. It is now proposed to allow the slab to stand from 4 to 6 weeks. At the expiration of this time, the test will be completed by loading the slab to failure."

13 Use of "Over-Sanded" Mixes of Concrete

"In commercial work, it has been found that concrete foremen will decrease the ratio of sand to gravel so as to produce a better working concrete, namely, one with more fine material in it, and preliminary work has been started in the laboratory to determine the effect of "over-sanding" the time-honored 1:2:4 and 1:3:6 mixes in which the ratio of fine to coarse aggregate is 1 to 2. Very often with the very best of material these standard mixes, if actually used, will produce harsh, segregating, unworkable mixes. This is particularly true when crushed slag or crushed stone are used as coarse aggregate. One of the tests which has been carried out was in conjunction with a practical problem. A crushed limestone was submitted for test in 1:2:4 concrete with river sand as the fine aggregate. This mix was made but was found to be harsh and segregating. A 1:3:3 mix of the same materials was found to be much more workable when made so as to have the same consistency. Strengths were found to be higher for the over-sanded mix at an age of 28 days, and it was also found that contrary to the general belief less cement was used in the over-sanded mix. The following table shows the results numerically:

Mix	% Water	Cement Lb. per cu. yd.	Compressive strength Lb. per sq. in. 28 days old
1:2:4	8.33	508	768
1:3:3	8.86	487	988

The consistency was wet and was the same for both mixes.

Further tests are under way and the following mixes in two consistencies have been made up: 1:2:4, 1:2½:3½, 1:3:3 and 1:3:6, 1:3½:5½, 1:4:5. Seven-day strength results show that all mixes of the same proportion of cement to aggregate have substantially the same strength and also that the mixes with the most sand use the least amount of cement per cubic yard. "

14 Effect of Soaking Concrete in Magnesium Fluosilicate and Sodium Silicate Solutions

" Experiments to determine the effect upon the strength and permeability of concrete due to curing it for different periods of time in solutions of magnesium fluosilicate and sodium silicate have been completed. These tests, although of a preliminary nature and limited in extent, appear to indicate that rich concrete mixtures may be improved in strength by curing for certain periods in magnesium fluosilicate but are not made less permeable. Both 1:1:2 and 1:2:4 proportions were improved in strength and made slightly less absorptive by curing in sodium silicate solutions. A summary report on these experiments is available for distribution. "

Respectfully,

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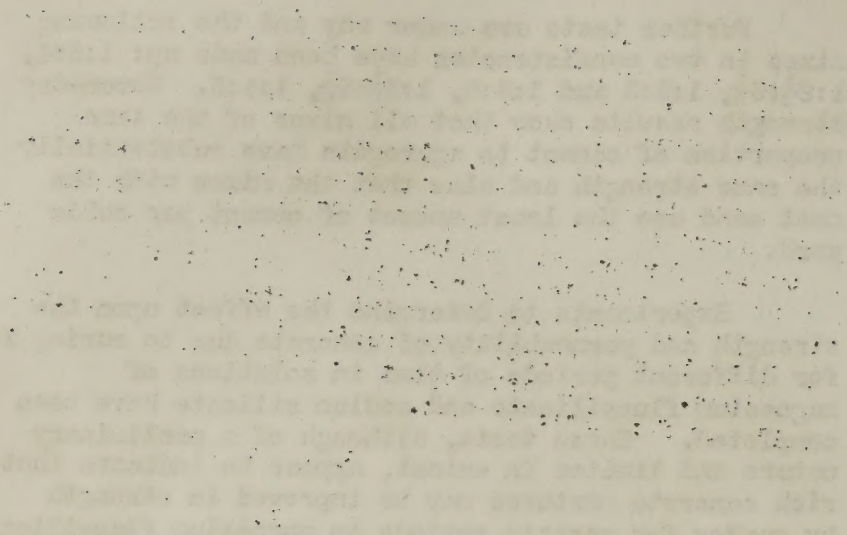
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